Homestake Update

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Nomenclature

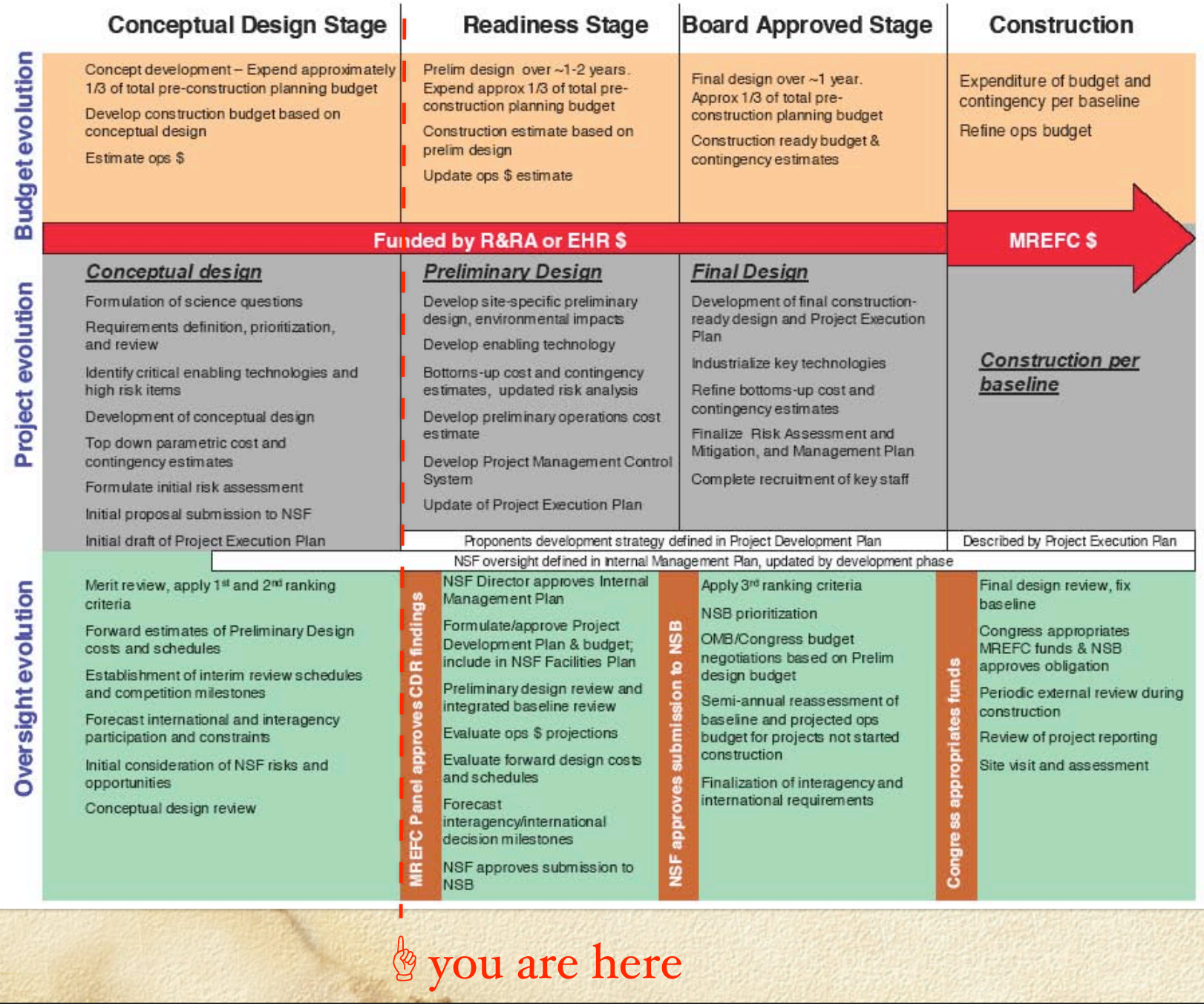
- Sanford Lab - *noun* - surface to 4850L, mostly the Davis Cavity ($65M State-run project)
- Sanford Lab hosts Early Implementation Program ~ 12 experiments between 2007 and 2011 (starting point for DUSEL)
- DUSEL - *noun, verb* - NSF process to establish an MREFC and create a major new user facility ($500M total = $250M facility, $250M expts.)

The Vetting of DUSEL

2000 2005 2010

NuSAG 2005, 2006
Dark Matter SAG 2006
EPP2010
HEPAP 2006
Site-selection
S-1 Complete
CDRs Review
EarthScope 2005
Physics of the Universe 2004
S-2 Awards
1st S-1 Workshop
Neutrino Matrix 2004
NSF DUSEL Reorganization 2004
DOE Facilities 2003
EarthLab 2003, HEPAP LRP 2003
Neutrino Facilities Report 2003 (SNOLab Presented)
NeSS 2002
NP LRP 2002
Quarks to the Cosmos 2002
SNOWMASS July 2001
Bahcall Committee report, March 2001
Nuclear Science Advisory Committee, March 2001
Oakland DNP Town Meeting, Oct. 2000
Working Group on Underground Science
Seattle Neutrino Pre-Town Meeting, Sept 2000
Working Group on Underground Science

Figure 1: *Summary of the pre-construction planning and development process for candidate MREFC projects.*



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Initial Suite of Experiments

- Main DUSEL Construction to begin in FY 11
  - $250M for the facility
  - $250M for the Initial Suite of Experiments (ISE)
    - Funds to be made available in 2008 to bring the ISE to the same level of "readiness" as the facility, must be submitted together
    - Process to establish the ISE to be determined soon
    - Town Meeting 2 - 4 November 2007 to begin process
    - http://cosmology.berkeley.edu/DUSEL/Town_meeting_DC07/

Updates to Homestake - Sanford Lab

- January 2007 - rehabilitation work started
  - surface buildings, Ross hoists
  - video inspection of Ross and Yates
- May and June major contractor mobilization
  - 5 supervisors, ~ 30 local hires
  - Ventilation re-established
- July 2007 - initiated shaft work in Ross
  - currently working down to the 2100L

Initial Science Program Initiated: geology, hydrology, biological sampling taking place with re-entry

Rehabilitation work

- replacement and rehabilitation of pumps and motors
- replacement of utilities including power and communications
- removal of abandoned components including old pump columns
- Asbestosis abatement on old steam pipes - near surface
- Inventory and replacement of steel sets

Rescue Under Way After 3,200 Workers Trapped in South African Gold Mine

Thursday, October 04, 2007

Associated Press

AP

Oct. 4: Mine workers come out of the cage at Harmony Gold's Elandsrand Mine south west of Johannesburg, South Africa.

CARLETONVILLE, South Africa — Rescuers struggled to bring up the remaining 500 South African gold miners trapped for more than a day deep in a shaft after an accident damaged an elevator.

There were joyful reunions on the surface Thursday and — although none of the 3,200 trapped in all was injured or killed — also anger, fear and renewed concern about safety standards in a country that is the world's largest gold producer.

A pressurized air pipe snapped at the mine near Johannesburg and tumbled down a shaft Wednesday, extensively damaging an elevator. Some of those stranding more than a mile (a kilometer and a half) underground had gone down Tuesday for the night shift.

• Click here to view photos.

The trapped workers were being brought to the surface in a second, smaller cage in another shaft that can hold about 75 miners at a time, about half the normal passenger capacity. Most of the miners who emerged into the blinding sunlight looked dazed and exhausted. The mineworkers union said 500 people were still trapped at evening.

"We nearly died down there," one man yelled as he walked past reporters. "I'd rather leave (the job) than die in the mine."

Dewatering Homestake

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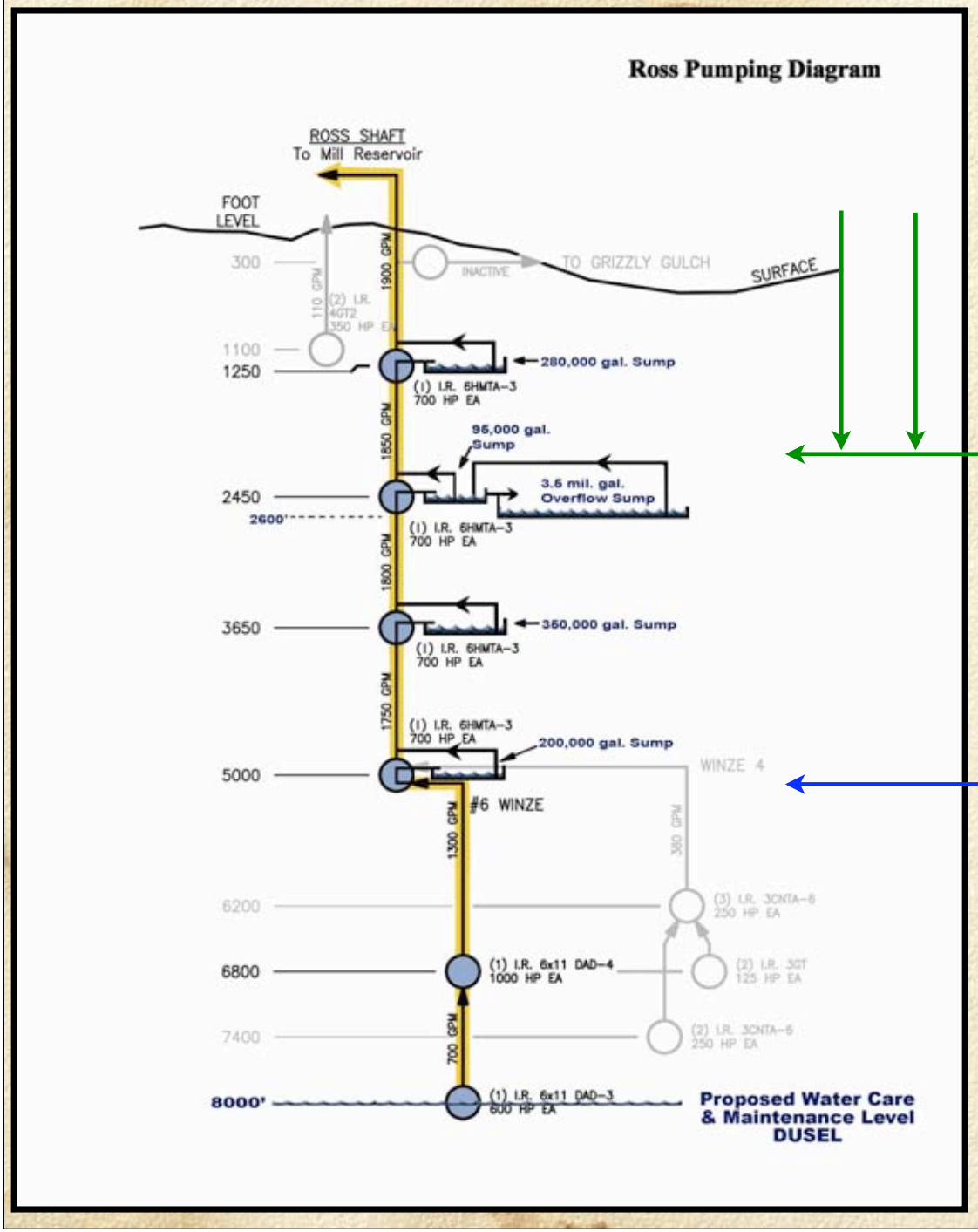
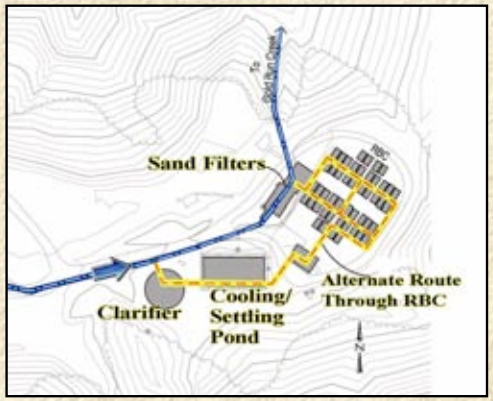
Current Water Levels



Re-entry Efforts, begun in July, have inspected levels and shafts down to 2100 L

Focus on turning on pumps at 1250L and 2450L

5000 level tripped July 2007 (6 weeks earlier than original model)



Homestake Progress

- SDSTA hired Laboratory Director (9 October 2007) Jose Alonso (Berkeley)
- reviewing CVs for Project Manager, Project Engineerings, additional staff, PM, PEs expected in October
- 5 to 12 hires in 2007
- Yates Shaft work to be bid and initiated this year
- Sanford Lab Experimental Program to be advanced to engineering drawings and bid

Experiment Name	PI(s)	Institution	Letter of Interest	Memorandum of Understanding	Brief Description
LUX: Development of a large liquid xenon dark matter detector	Rick Gaitskell Tom Shutt	Brown Case Western	Yes	Yes	Direct Detection of Dark Matter using cryogenic liquid Xe, detection of signals and separation of signal from background using scintillation light. Detector requires several meters of water shielding to reduce backgrounds. 4850L Davis Cavity is appropriat
Collaborative Research Towards Transparent Earth	Steven Glaser Lane Johnson Bill Roggenthen	UCB UCB SDSM&T	Yes	Yes	This proposal presents a plan to install and operate a permanent seismic observatory illuminating the volume of the Homestake Mine from all six possible directions. We have chosen the Homestake DUSEL site because it offers a unique opportunity - the large
Low Background Counting Facility, DOE BES ESPSoR	Dongming Mei Bill Roggenthen	USD SDSM&T	Yes	Yes	Develop a state-of-the-art Low Background Assay Facility in the Davis Cavity (4850L)
miniCLEAN	Andrew Hime	LANL	Yes	MOU under discussion	Direct Detection of Dark Matter using cryogenic noble gases.
Liquid Argon Dark Matter	Dongming Mei Andrew Hime KTL	USD LANL LBNL	Yes	MOU under discussion	Direct Detection of Dark Matter using cryogenic noble gases.
Homestake: Biological, Chemical and Geological Sampling	Sookie Bang Mark Conrad	SDSM&T LBNL	Yes	Yes	Site Characterization and baseline establishment for biology, chemistry, hydrology, and geology
Majorana: Neutrinoless double beta decay R&D	John Wilkerson Steve Elliott	U.W. LANL	Yes	MOU being developed August 2007	Development of ultrapure materials, low background counting and Ge detector demonstration module
Large Cavity Development and R&D	Milind Diwan Ken Lande	Brookhaven Penn	Yes	Yes	Develop plans for large cavities and water-Cerenkov detectors for nucleon decay and long baseline neutrino experiments
Carbon Sequestration Experimental Design	Joe Wang Kevin Lesko	LBNL LBNL	Yes	Yes	Development of experimental designs for carbon sequestration facilities and the behavior of super-critical CO2 in the underground

Dark Matter

Geo/seismic array

Low Background Counting

Dark Matter

Dark Matter

Geo/Bio

Neutrinoless ββ

Large Cavities, LBL νs

Carbon Sequestration

4850L Lab Modules, Shops, and Common Facilities Phased Development Plan

Existing Neutrino Chamber: Davis Experiment 56' x 30' x 26'

Yates Shaft

#1 Excavation in FY2007-9
Yates & Davis Labs
Bio- & Geo-sciences Lab
Construction Shops

#2 Excavation in FY2010-12
Common Facilities
Lab Modules #1 and #2

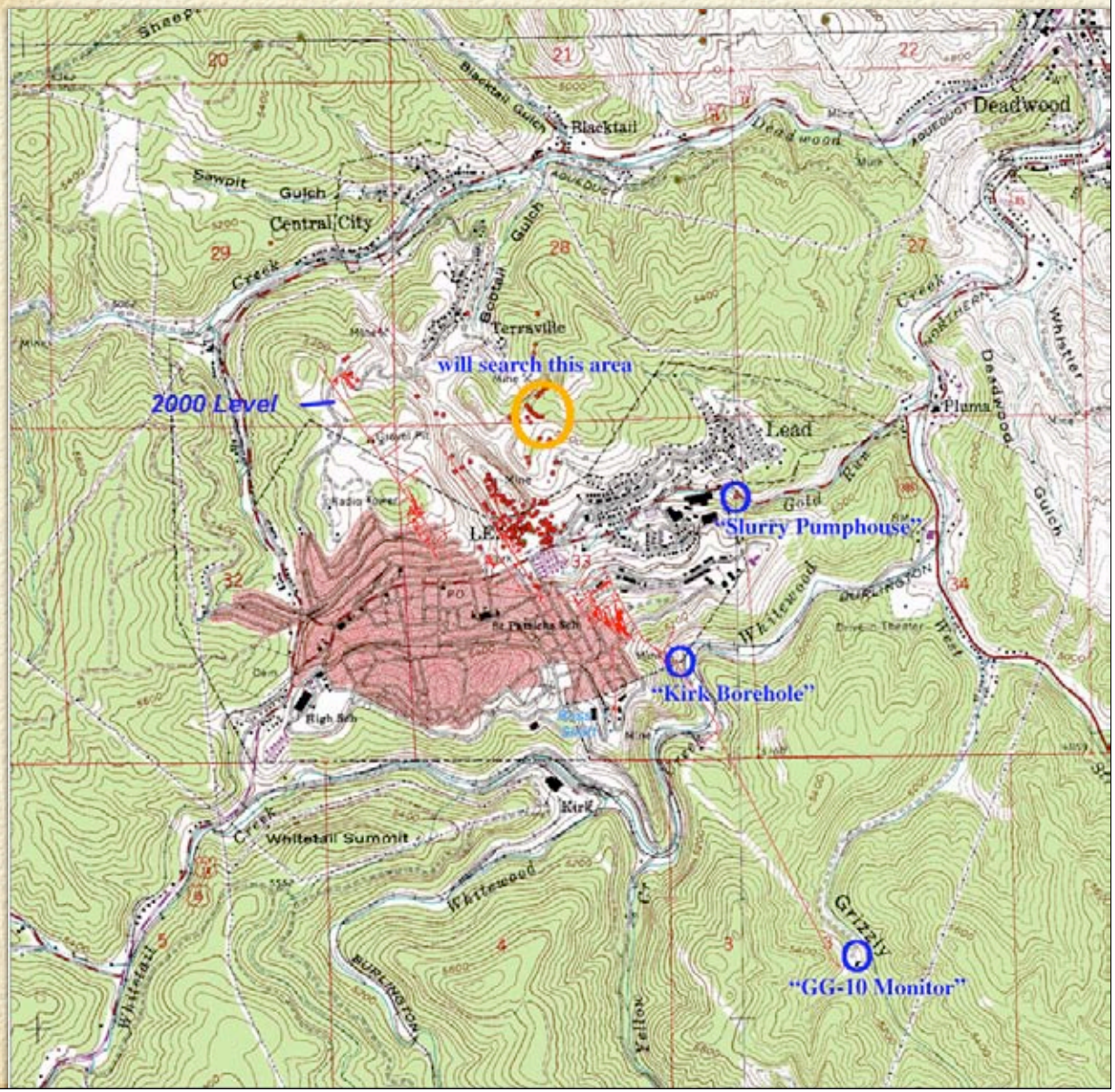
#3 Excavation in FY 2011-13
Lab Modules #3 and #4

Ross Shaft

Total excavated space for labs, shops, and common facilities at 4850L: > 6,000 m^2 (65,000 SF)

Surface Seismic Array

Todd Deux, Jeff Moore, and Bill Roggenthen identified candidates for seismic sensor installation on Monday, August 20, 2007.



references

- http://www.lbl.gov/nsd/homestake/
- http://www.lbl.gov/nsd/homestake/Posters.html (information presented at the NSF review)

Yates Shaft Upgrade Plan

Improved access to the 4850 Level for personnel,

Existing Cage Dimensions and Capacities

Yates Cage Hoist

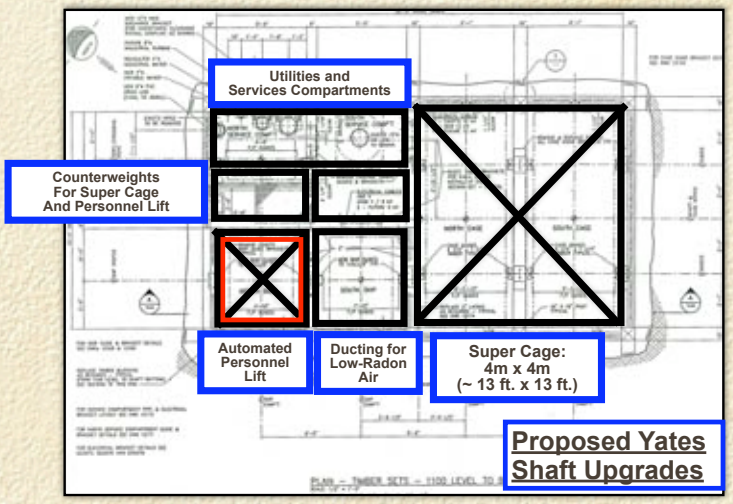
Maximum cage dimensions: 1.4 x 3.7 x 2.2m high (side-by-side)
(4' 8" x 12' 1.5" x 7' 2" high)
Maximum cage payload: 5,450 kg (12,000 lb), nominal
5,900 kg (13,000 lb), allowable at 1/2-speed.

Ross Cage Hoist

Maximum cage dimensions: 1.3 x 3.8 x 2.2m high (double deck)
(4' 4-5/8" x 12' 5" x 7' 2" high)
Maximum cage payload: 5,450 kg (12,000 lb, nominal
6,100 kg (13,400 lb), allowable at 1/2-speed.

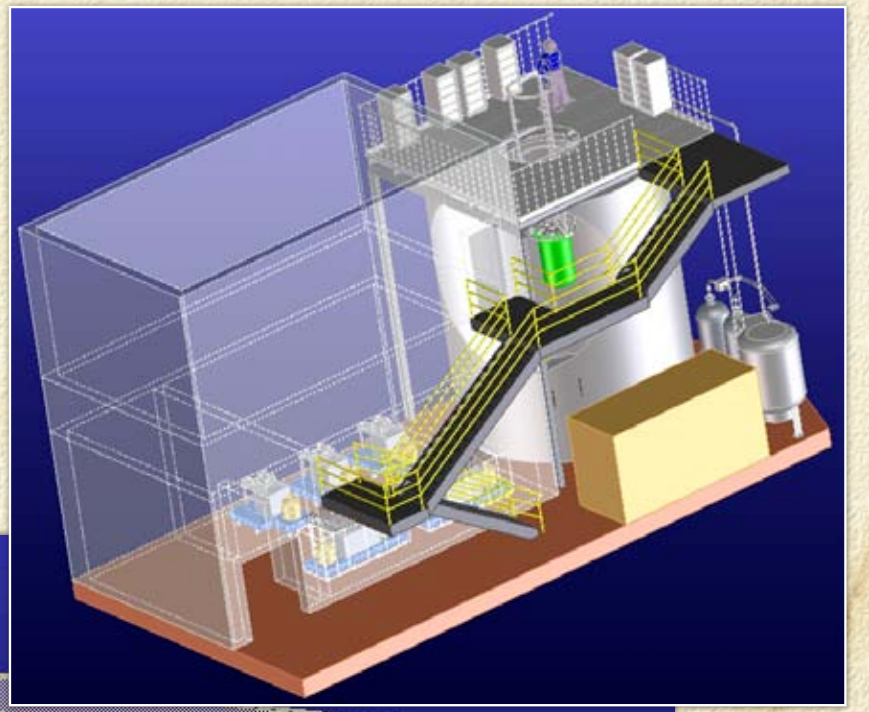
#6 Winze Cage Hoist

Maximum cage dimensions: 1.3 x 3.7 x 2.2m high (double deck)
(4' 4" x 12' 1-1/2" x 2.2m high)
Maximum cage payload: 5,450 kg (12,000 lb), nominal
6,400 kg (14,000 lb), allowable at 1/2-speed.

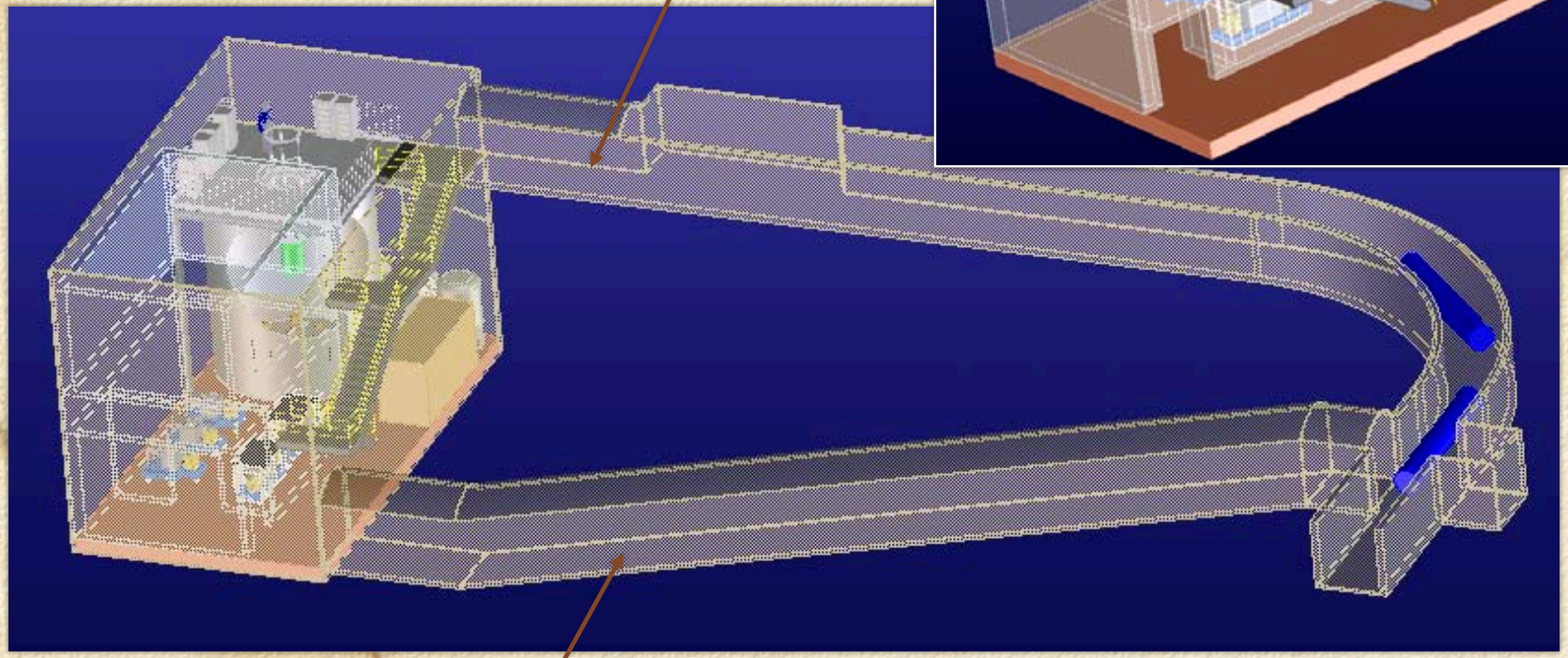


Dark Matter Experiment with Low Background Facility

Current Davis Cavity Dimensions:
55ft x 30ft x 32ft high



4850L Access



4850L Secondary Access

- A few comments and responses to recent discussions about large detectors and DUSEL.

As stated in the *Summary of Program Requirements* in S3, "the guiding principle governing the review process for the proposals in response to this solicitation is to select and develop the site-specific plan that shows the greatest potential for development of a world-leading DUSEL at the best cost/risk value to the government, and that would enable the science and engineering activities defined by the relevant communities, as referenced below [in S3]." This principle governed the entire S3 review process, including its design, and the related Panel deliberations.

1. Suitability of the Site

a. Ability of the site to support the facility needs at the surface, and the depth and size of experimental halls proposed and future expansions
b. Subsurface characterization: geological, geotechnical, radiation backgrounds, hydrological, thermal, etc.
c. Access to underground labs – people and cargo capacity – max size, weight, rate
d. Availability of Services – power, cooling water, HVAC (normal and emergency)
e. Location of site
    i. Proximity to airport, roads, etc.
    ii. Availability of schools, hospitals, local housing, food services, etc.
    iii. Availability of, or ability to attract, technical, scientific, engineering and other Laboratory personnel
f. Other considerations
    i. Implications or possible consequences of sharing the proposed site with a non-DUSEL entity
    ii. Excavation and infrastructure needs and requirements
    iii. Overall facility cost; overall facility risk
    iv. Time scale for availability for science and engineering
g. Environmental, permitting and legal issues
h. Local government and community/regional relations; relations with property owners

Suitability of the proposed site (extracts from site review)

- "The "mega detector" for proton decay and neutrino oscillation experiments require a very large hall. … Space for a significant surface facility near the underground lab was considered important - … a distance larger than about 1100 km from a potential neutrino source is an important consideration for long baseline neutrino experiments.
- At Homestake access to underground spaces for personnel is excellent, with two shafts maintained to the initial 4850 level offering greater flexibility and safety with a short and direct route between the the two shafts.

- Cargo capacity for experiments and rock removal is adequate, but larger capacity, both in size and weight, is *possible and desirable* (emphasis is mine). Thus Homestake offers the possibility of designing and implementing an access system that is optimize for the requirements of DUSEL.

- The facility design and the science and engineering activities described in the Homestake Proposal are excellent and satisfy the requirements outlined in the above report [deep science] for a deep underground laboratory.

- The characteristics of the site and the proposed facility are well suited for the purposes of a deep underground lab. The distance to Fermilab, the most likely source of neutrinos, is adequate. The proposed access to the underground areas is good, although the Panel felt that hoists larger than proposed (…) are desirable, and are possible to implement.
- There are thus no concerns associated with sharing the site with a commercial operation.
- And finally the Panel considered the proposing team to be very strong and well qualified to carry out the proposed program.